Developmental Test Command's (DTC's) Aberdeen Test Center Is Focusing on the Future

Michael Cast

As the Army grapples with the technological complexities of developing and fielding its Future Combat Systems (FCS), the Army Test and Evaluation Command (ATEC) and its subordinate commands are working to ensure the testing and evaluation process directly contributes to the program's success and effectiveness. At DTC's Aberdeen Test Center (ATC), Aberdeen Proving Ground (APG), MD, unique capabilities exist for helping ATEC test and evaluate the 18 FCS, the network and the Soldier who will link them all together in a configuration the Army refers to as "18+1+1." Support for FCS throughout the DTC and its ATC is undergirded by innovative technologies and test procedures as well as emerging partnerships with the FCS program's other key players.

The program to develop FCS will rely heavily on DTC's test and evaluation program, and ATC will be a key player in engineering and testing its unique capabilities. (Image courtesy of ATC.)

The FCS System Integration Lab Optimization Study Team visited ATC in December 2005, looking for ways to consolidate technologies and processes whenever possible to reduce government expenditures on the FCS test and evaluation program. ATC sponsored briefings and tours for them, covering facilities and capabilities at APG that can provide valuable and unique support to the FCS test and evaluation program.

From Data Collection to Live-Fire Survivability/ Lethality Testing

ATC conducted more than 1,500 tests in FY05, completed nearly 470,000 miles of roadway tests and is the Army's premier test center for land combat systems such as tanks and trucks. "The experience and capabilities ATC has developed for testing such systems can provide crucial FCS program support," remarked Harry Cunningham, Director of ATC's Future Force Directorate. "ATC's unique capabilities have given us a proven track record for acquiring valuable test data from diverse locations and transmitting it in real time, or near-real time, to test customers and decision makers, regardless of location."

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One ATC initiative making this possible is the Versatile Information System Integrated Online (VISION), which includes:

- State-of-the-art instrumentation for collecting data.
- Use of a Mobile Ground Station for tests in remote locations.
- Communications for rapidly distributing test data, including by satellite.
- An online digital library for posting test data and reports, photos, video feeds and other test information easily accessible to test customers and other authorized users.

Under congressional mandate, ATC is the Army's lead test center for live-fire survivability and lethality testing. ATC has decades of experience in conducting this testing and the right mix of ranges, instrumentation and expertise to conduct such testing for FCS. ATC is also DOD's lead center for direct-fire testing of firepower systems and has partnered with the Army Research Laboratory in testing electromagnetic and electrothermal/electrochemical ignition systems.

ATC Conducts Tracked and Wheeled Vehicle Testing

Electric and hybrid-electric vehicle testing is another area where ATC has experience and facilities applicable to the FCS program. The FCS-Tracked, a diesel-electric vehicle with a band track and lithium ion batteries, and the FCS-Wheeled, a turbine-electric 8-by-8 wheeled vehicle with an advanced structure/armor, are two prototypes unveiled by United Defense Industries in October 2002 featuring hybrid-electric drive systems.

Though a great deal of ATC's automotive testing occurs at various outdoor automotive courses at APG and another site in Churchville, MD, the center can also conduct tests and experiments in an indoor laboratory setting on its Roadway Simulator. The Roadway Simulator is the world's largest flat-track simulator for automotive testing — a technology enabling testers at ATC to replicate various driving and road conditions with computer input. It is designed to handle vehicles as small as an Army Humvee or as large as a tractor-trailer rig, and is used to test braking and steering, suspension system and powertrain performance and various other automotive-performance characteristics. According to ATC personnel, the Roadway Simulator will be modified with new pedestals to accommodate the smaller wheel base of the FCS Manned Ground Vehicle variants.

Common data-collection technologies, protocols and data formats, which can support FCS test and evaluation across ATEC, are found in the Common Vehicular Instrumentation Initiative (CVII). Under this initiative, ATC has worked closely with ATEC's Operational Test Command to develop this suite of instrumentation technologies to collect the full range of performance data from test systems. CVII is designed to support data acquisition on everything from the performance of global positioning and communication systems to the performance of weapons and automotive systems. Additionally, the Army is looking at having common instrumentation embedded in vehicles as they are manufactured to enable data collection from them not only during testing but also throughout their life cycle.

One element of this initiative developed by engineers at ATC is the Advanced Distributed Modular Acquisition System (ADMAS), a configurable instrumentation suite designed to collect automotive performance data such as engine temperature, powertrain performance, fluid temperatures and fuel consumption.

ADMAS has been designed to fit in vehicles much smaller than tanks and

ATC is the Army's premier test center for land combat systems such as this Bradley Fighting Vehicle maneuvering in the Iraqi desert. ATC scientists and engineers are improving combat system survivability and lethality through rigorous performance testing, continuous research and development, and modeling and simulation. (U.S. Air Force photo by SSGT Shane A. Cuomo.)

trucks. With the aid of microchip technology and small memory cards such as those used in digital cameras, ADMAS has been miniaturized to produce Pocket ADMAS, a version about the size of a cigarette pack, which could fit unobtrusively on relatively small platforms such as unmanned ground vehicles (UGVs) or be used on individual Soldiers.

UGVs designed to scout and reconnoiter dangerous areas, remove dangerous objects such as mines, or serve as platforms for weapons or sensors are integral FCS components, and ATC is DTC's lead center for testing them.

ATC's Roadway Simulator is the largest facility of its kind in the United States. It will play a significant role in testing the Army's FCS components. (Photo courtesy of ATC.)

Aberdeen Common Control Node (CCN)

In addition to ADMAS and VISION, ATC has undertaken initiatives that position it to support FCS testing, according to John Wallace, ATC Director. Among other projects, ATC will develop line-of-sight (LOS) and beyond-LOS ranges, a research and development range to test active protection systems designed to shield FCS systems from attack, a hybrid-electric-propulsion test laboratory, a test course for UGVs and the CCN.

The CCN, which is being constructed under the auspices of the FCS Combined Test Organization (CTO), was a key subject of the December 2005 briefings. The CCN at APG is designed to complement and augment Boeing's $35 million System-of-Systems Integration Laboratory (SoSIL) in Huntingdon Beach, CA. The SoSIL is a 140,000-square-foot testing and simulation lab designed to allow Soldiers and civilian experts to work together to develop, test and evaluate the FCS network connecting vehicles and warfighters on the battlefield.

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The APG facility is a phased project, with construction already underway. The initial phase of construction is expected to be completed this spring and the final phase is planned for completion in June 2007. When completed, it will include a viewing portal, also referred to as the test operation meeting center, for video teleconferences, test-event viewing and similar purposes, and two after action review meeting centers geared toward test directors. Among other features, the CCN will also contain a tactical operations control center, a server room, office space in various sections of the building, integrated system and test facilities, and areas for the operation of red, blue and gray cells, which represent enemy and friendly forces and noncombatants. Construction of a similar facility at DTC's White Sands Missile Range (WSMR), NM, is nearing completion.

The Road Ahead

The Army Science Board and the Senior Advisory Board of the Defense Advanced Research Projects Agency have recommended several areas of concentration for FCS/Future Force systems. Among these are an electromagnetic gun with a pulsed power supply, conventional cannon to supply direct and indirect fire, directed-energy weapons, robotics, wireless communication systems and sensors, hypervelocity anti-tank rounds, advanced armor and active-protection technologies.

When asked by one of the scientists on the optimization team how ATC can realistically prepare itself to test FCS systems that have not yet gone from the drawing board to reality, Cunningham referred to the Operational Requirements Document (ORD) — the formal Army document that spells out the capabilities required. "The ORD gives us an idea of what these FCS systems will be," he projected. "It gives us clues as to where the Army may be headed."

To help the Army get where it is going, ATC and other DTC test centers have participated in several exercises that challenged their FCS testing capabilities, the most recent in August 2005 called Distributed Test Event 5. It was also known as the Multi-Service Distributed Event because of Air Force and Navy participation. Its purpose was to help participants develop technologies, tactics, techniques and procedures (TTPs) to pave the way for realistic testing of FCS and the network linking them, and to provide the capabilities for testing to reflect a Joint-service role in future military operations.

Range and Test Control Centers

DTC is developing an Inter-Range Control Center (IRCC) at WSMR and a Distributed Test Control Center (DTCC) at each of its test centers across the United States. IRCC is designed to be the control center for testing simultaneously across multiple sites and orchestrating events to keep them on track with test objectives. IRCC has played a leading role in past distributed events and has served as the point of entry in these events for the FCS Lead Systems Integrator — Boeing and Science Applications International Corp. DTCC is the event controller at the test-center level.

A network test node at ATC was established in collaboration with the Electronic Proving Ground, the lead DTC center for electronics and communications testing and network connectivity issues. This effort enables the simultaneous testing of the network while the platform is being exercised. Combining these two disparate test functions helps DTC to enact the FCS CTO philosophy of "Plan Together — Test Once," according to Cunningham. ATC is also actively engaged in providing fiber optic connectivity to the ranges that will be used by FCS. The ATEC Test Integration Network (ATIN) is designed to support the inter-range and intra-range connectivity requirements. This connectivity is designed to support network-centric testing during the development process by linking FCS development teams to Army test ranges, private-industry's system integration labs and other services.

ATC's Fire Impulse Simulator, known as "gun banger," is used to test recoil on gun systems. It is one of several Virtual Proving Ground capabilities employed to test FCS. (Photo courtesy of ATC.)

Modeling and simulation will increasingly play a role in the Army test and evaluation of FCS and the technologies and TTPs associated with using the System-of-Systems. (Artwork courtesy of DTC's Test Technology Management Division.)

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